NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

[Document Number NASA-22-024; Docket Number-NASA-2022-0002]

National Environmental Policy Act; Mars Sample Return Campaign

AGENCY: National Aeronautics and Space Administration.

ACTION: Notice of intent; notice of meetings; request for comments.

SUMMARY: Pursuant to the National Environmental Policy Act of 1969 (NEPA), as amended, the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA, and NASA's procedures for implementing NEPA, NASA will prepare a Programmatic Environmental Impact Statement (PEIS) for the Mars Sample Return (MSR) Campaign; cooperating agencies for this effort include the U.S. Air Force (in accordance with, *Environmental Impact Analysis Process*), U.S. Army, U.S. Department of Agriculture, and U.S. Department of Health and Human Services – Centers for Disease Control and Prevention. The PEIS will provide information related to the potential environmental impacts associated with the proposed return of Mars samples to Earth for scientific analysis. Potential impacts to be analyzed in the PEIS include those associated with ground disturbance from landing site preparation, and sample vehicle landing and recovery efforts with respect to natural, biological and cultural resources. NASA will also assess potential impacts to the human and natural environment associated with loss of containment of Mars sample materials. Additional information about the MSR Campaign may be found on the internet at: http://www.jpl.nasa.gov/missions/mars-sample-return-msr.

DATES: The public scoping period for this PEIS is for a period of 30 days from publication of this notice. Fact sheets and other information regarding the NEPA and scoping process for the MSR Campaign will be made available at the following website beginning on April 15, 2022: www.nasa.gov/feature/nepa-mars-sample-return-campaign.

NASA will hold two VIRTUAL public scoping meetings to solicit comments regarding the Proposed Action and the environmental issues which NASA should consider in the PEIS. The virtual meetings will be held on May 4, 2022; 1pm – 3pm (Mountain) and May 5; 6pm – 8pm (Mountain) at the following URL: https://jpl.webex.com/meet/msr. The call-in number for audio-only users is: +1-510-210-8882.

The meetings will begin with a brief welcome message followed by a 10-minute NASA presentation describing the purpose of the scoping meetings, project schedule, opportunities for public involvement, proposed action and alternatives summary, and programmatic approach. A 20-minute technical presentation regarding the MSR Campaign will then be provided. After the formal presentations will be a 30-minute virtual "Open House" and question and answer session where meeting participants can ask questions of the panel presenters. After the technical presentations and question and answer session, the official scoping comment submission portion of the meetings will begin. The scoping comment submission session will be 55-minutes, where members of the public may provide up to a three-minute comment. The virtual public meetings may end later than the stated time depending on the number of persons who wish to submit a comment. At this time, NASA does not intend to provide English-language translation unless specifically requested at least one week prior to the meetings.

NASA expects to release a Draft PEIS for public and agency review and comment in Fall 2022, and a Record of Decision in Spring/Summer 2023.

ADDRESSES: Advance registration to attend or provide a comment at either of the virtual public meetings is not required. As noted above in **DATES**, public meeting attendees may submit comments during the public meeting, or by other means described below throughout the 30-day comment period. Please provide your comments no later than May15, 2022 to ensure consideration in the Draft PEIS.

Comments must be identified with Docket No. NASA-2022-0002 and may be sent to NASA as follows:

- Federal E-Rulemaking Portal: http://www.regulations.gov. Follow the online instructions for submitting comments. Please note that NASA will post all comments on the Internet without changes, including any personal information provided.
- By mail to Steve Slaten, NASA Jet Propulsion Laboratory, 4800 Oak Grove Drive, M/S: 200-119, Pasadena, California 91109-8099.

We encourage you to submit comments electronically through the Federal eRulemaking Portal at http://www.regulations.gov. If you submit your comments electronically, it is not necessary to also submit a hard copy. All comments received will be posted without change to http://www.regulations.gov. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment – including any personal identifying information you provide – may be publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

FOR FURTHER INFORMATION CONTACT: Mr. Steve Slaten, National Aeronautics and Space Administration, by electronic mail at Mars-sample-return-nepa@lists.nasa.gov or by telephone at 202-358-0016. For questions regarding viewing the Docket, please call Docket Operations, telephone: 202-366-9317 or 202-366-9826.

SUPPLEMENTARY INFORMATION:

NASA, in coordination with the European Space Agency (ESA), proposes to conduct a campaign to retrieve a scientifically selected set of samples (i.e., Martian rocks, regolith, and atmosphere), acquired and cached on the surface of Mars by the Perseverance rover, and return them to Earth for scientific analysis and research. The proposed landing and recovery location for the Mars samples is the Utah Test and Training Range (UTTR), which is under the jurisdictional control of the United States Air Force. Additional Earth-based ground elements associated with sample transportation (utilizing over-the-road and/or aircraft to transport the samples off the UTTR) and sample management/research (otherwise referred to as “curation”)

involving the development and operation of a Sample Return Facility (SRF) are also part of the MSR Campaign mission architecture.

Virtual Public Meetings and Virtual Open House and Q&A

We encourage you to visit the informational website at www.nasa.gov/feature/nepa-mars-sample-return-campaign and attend one or both of the virtual public scoping meetings to learn about, and comment on, the proposed MSR Campaign. You will have the opportunity to verbally submit comments during the virtual public meetings on the scope and significance of the issues related to the proposed MSR Campaign that should be addressed in the PEIS.

In order to allow everyone a chance to speak at the virtual public meetings, we may limit speaker time, extend the meeting hours, or both. You must identify yourself, and any organization you represent, by name. Your remarks will be recorded and/or transcribed for inclusion in the public docket.

Public docket materials will be made available to the public on the Federal Docket Management System website (www.regulations.gov).

If you plan to attend one of the virtual public meetings and need special assistance such as sign language interpretation or closed captioning, non-English language translator services, or other reasonable accommodation, please notify the NASA representative identified above in the **FOR FURTHER INFORMATION CONTACT** section at least seven business days in advance of the virtual public meeting. Please include your contact information as well as information about your specific needs.

Request for Comments

We request public comment on this proposal. The comments may relate to, but are not limited to, the environmental impact of the proposed action. All comments will be accepted. The virtual public meetings are not the only opportunity you have to comment on the MSR Campaign proposed action. In addition to, or in place of, attending one of the virtual meetings, you may submit comments directly to the Federal Docket Management System during the public comment

period (30 days from this notice). We will consider all comments and material received during the 30-day scoping period.

The material presented at the public meetings, received comments, and associated documentation, as well as the draft and Final PEISs (when published) are available for viewing at www.nasa.gov/feature/nepa-mars-sample-return-campaign.

Regardless of the method used for submitting comments, all submissions will be posted without change to the Federal Docket Management System website (http://www.regulations.gov) and may include any personal information you provide. Therefore, submitting this information to the docket makes it public. You may wish to read the Privacy and Use Notice that is available on the Federal Docket Management System website (Regulations.gov – https://www.regulations.gov/user-notice). You may view docket submissions at the Federal Docket Management System or electronically on the Federal Docket Management System website.

Background

Information about the MSR Campaign is available at: http://www.jpl.nasa.gov/missions/mars-sample-return-msr. Consideration of the proposed MSR Campaign includes review of the proposed action on the natural and human environment. For the proposed MSR Campaign, NASA is coordinating its review with a number of Cooperating Agencies that have jurisdiction by law over part of the proposed action or have special expertise with respect to environmental issues related to the proposed action. NASA is the lead Federal agency for determining the scope of this review, and in this case, it has been determined that review will include preparation of a PEIS. This NOI is required by 40 CFR 1501.9. It briefly describes the proposed action, possible alternatives, and our proposed scoping process. You can address any questions about the proposed action, the scoping process, or the PEIS to the NASA project manager identified in the notice (see **FOR FURTHER INFORMATION CONTACT**).

Proposed Action and Alternatives

The proposed action requiring environmental review is NASA's proposed MSR Campaign (see below: **Summary of the MSR Campaign**). The alternative to undertaking the MSR Campaign is to not undertake the campaign, which for purposes of environmental review under NEPA, is the "no-action" alternative.

Scoping Process

Public scoping is an early and open process for identifying and determining the scope of issues to be addressed in the PEIS. Scoping begins with this notice and continues through the conclusion of the public comment period (see **DATES**). Once the scoping process is complete, NASA will prepare a draft PEIS. When complete, NASA will publish a **Federal Register** notice announcing public availability of the Draft PEIS. (If you want that notice to be sent to you, please contact the NASA project manager identified in **FOR FURTHER INFORMATION CONTACT.**) You will have an opportunity to review and comment on the Draft PEIS. NASA and other appropriate Cooperating Agencies will consider the received comments and prepare the Final PEIS. As with the Draft PEIS, we will announce the availability of the Final PEIS and give you an opportunity for review and comment before a Record of Decision is announced.

Summary of the MSR Campaign:

Overall, the MSR Campaign spans six elements: four flight elements, which include the Perseverance Rover, two Sample Retrieval Landers ("Landers" – a Sample Fetch Rover Lander and Mars Ascent Vehicle Lander) and their subcomponents, and the Earth Return Orbiter (the "Orbiter"), its subcomponents and recovery of the samples; and two ground elements, which include sample transportation and an SRF. The following is an overall summary of the MSR Campaign.

The Perseverance Rover (previously addressed in the *Final Supplemental Environmental Impact Statement for the Mars 2020 Mission*) (see https://www.nasa.gov/sites/default/files/atoms/files/20200115_mars_2020_seis_final_tagged.pdf) is currently collecting Mars samples in environmentally sealed and rigorously engineered tubes

and will eventually deposit select sets of tubes on the planet surface for later recovery. Specific Lander designs are still under consideration. NASA anticipates that the Lander payload mass and volume may result in the need for the equipment to be divided into two payloads, therefore requiring two separate Landers and launches. At this time, NASA has not confirmed if the use of Radioisotope Heater Units (RHUs) will be necessary to ensure that mission needs are met; the RHUs would generate heat, but no electricity, to support Lander function on the surface of Mars. If RHUs will be necessary, a payload of up to 20 RHUs may be included in the Lander designs.

The Landers are proposed for launch from either Cape Canaveral Space Force Station or Kennedy Space Center (depending on the launch vehicle yet to be selected). NASA anticipates launch of the Landers in of either 2026, 2028, or 2030 depending on the status of mission architecture and launch period availability. NASA anticipates Mars sample return to Earth approximately five years from launch of the Landers. The ESA Orbiter launch from French Guiana would then coincide with the NASA launch(es). All vehicles would transit to Mars. The Orbiter would enter Mars orbit, and the Landers would land directly on the Martian surface, similar to the recent Perseverance rover landing, in the vicinity of one or more sample tube sets. The samples would consist of approximately 35 tubes weighing about 25 grams each, for a total sample amount of approximately 525 grams (about 1 pound). Once on Mars, the Sample Fetch Rover would be deployed. The Sample Fetch Rover would then retrieve sample tubes left on the surface by Perseverance and deliver them to the Lander with the Mars Ascent Vehicle (MAV). If still operational, the Perseverance rover could also deliver sample tubes it retained on board directly to the Lander. A Sample Transfer Arm on the lander would be used to transfer samples from the Sample Fetch Rover and/or Perseverance rover into the Orbiting Sample container within the MAV.

The Mars Ascent Vehicle would be launched from the Martian surface into Mars orbit. Once in orbit, the Mars Ascent Vehicle would deploy the Orbiting Sample container to rendezvous with the Orbiter. Once at the Orbiter, the Orbiting Sample container would be

captured by the Capture, Containment, and Return System module. When retrieved by the Capture, Containment, and Return System module, the Orbiting Sample container would be stored in redundant containment vessels and placed in the Earth Entry Vehicle, creating the Earth Entry System (EES). The Orbiter would then leave Mars orbit and navigate to a trajectory that would bring it close to Earth without placing itself on an impact trajectory. After a series of system health and navigation checks, the Orbiter would then fire its thrusters to achieve a short-lived Earth return trajectory. Once this trajectory is confirmed and the proper point is reached, the Capture, Containment, and Return System module would release the EES on a path to enter the Earth's atmosphere. The EES would then enter Earth's atmosphere and descend, reaching a velocity of approximately 35 to 45 meters per second (around 78 to 100 miles per hour) before landing at the UTTR. After EES release, the Orbiter would navigate to a trajectory that would avoid Earth for over 100 years, ensuring that residual Mars material, if any, associated with the Orbiter is not returned to Earth.

Prior to EES landing, recovery teams would be staged at strategic locations surrounding the proposed landing site; the objective being to contain and recover the EES as quickly as possible. Staging areas would include communications equipment and vehicles (land and/or air) and equipment for use in transport to and from the landing site. The primary staging area would have a mobile containment system (or "vault"). Once the EES has landed, the recovery team would transit to the landing site and contain the EES. Because the samples should be treated as though potentially hazardous until demonstrated otherwise, the EES would be handled under the highest level of containment, handling, and transportation regulatory standards. Additionally, although release of Mars sample particles is considered an off-nominal event, recovery teams would handle the landing event as though a release has occurred, thereby ensuring proper containment and decontamination of the EES and landing site. After arrival of the recovery team, the landing site would be cordoned off, and a 100-square-meter (1,076-square-foot) tent would be erected over the EES. As a precautionary measure, the EES would then be decontaminated,

placed in a protective biohazard plastic bag, and then inserted into a 2-meter by 2-meter (6.56-foot by 6.56-foot) sealed travel case. The exterior of the EES travel case would be decontaminated before leaving the tent, and the EES travel case would be placed on a vehicle and transported to the roadside staging area and into the vault for shipment to an SRF. After removal of the EES, the entire contents of the tent and the landing site would be decontaminated as a precautionary measure. Samples of the landing site/impact area would also be taken for contamination knowledge/biological knowledge after the EES is removed but before decontamination of the area. These samples would be transported under containment with the EES to the SRF for analysis. Prior to, and in support of, EES landing the proposed landing area would be cleared of old target objects and other debris (e.g., railroad ties) that pose an impact risk to the EES.

"Planetary protection" is the discipline/practice of protecting solar system bodies (e.g., a planet, planetary moon, or asteroid) from contamination by Earth life and, in the case of sample return missions, protecting Earth from potential hazards posed by extraterrestrial matter. For missions returning samples from planetary bodies considered to potentially harbor life, NASA is required to address Presidential Directive (PD)/National Security Council (NSC)-25, *Scientific or Technological Experiments with Possible Large-Scale Adverse Environmental Effects and Launch of Nuclear Systems into Space*, by presenting detailed information regarding the importance and potential environmental effects of the mission in the MSR Campaign's PEIS. NASA's planetary protection policies address missions involving samples returned from various solar system bodies as detailed in NASA Policy Directive 8020.7G. The NASA policies are guided by the planetary protection policies published by the international Committee on Space Research (COSPAR) in response to the United Nations Outer Space Treaty. NASA Procedural Requirement (NPR) 8715.24, *Planetary Protection Provisions for Robotic Extraterrestrial Missions*, provides guidelines for categorizing missions according to the destination and proposed activity. NPR 8715.24 also provides specific procedural requirements for certain

mission categories. All missions returning samples from outside the Earth-Moon system are designated as Category V. Under Category V, there are two subcategories: Unrestricted Earth Return – sample return missions from solar system bodies deemed by scientific consensus to have no extraterrestrial life (e.g., Earth's Moon and Venus); and Restricted Earth Return (RER) – sample return missions from solar system bodies deemed by scientific opinion to have a possibility of harboring indigenous life forms (e.g., Mars or Europa). RER missions have requirements to break the chain of contact with the target body as well as isolate and robustly contain restricted samples during all mission phases through safe receipt and containment on Earth.

Due to the potential for past or present indigenous life forms on Mars, the sample return portion of the MSR Campaign is expected to be classified as a Category V Restricted Earth Return activity, which requires an environmental impact statement under 14 CFR 1216.306. The PEIS anticipates that this categorization will be established, and the PEIS' analysis provides for the most conservative approach. The general scientific consensus is that the Martian surface is too inhospitable for life to survive there today. It is a freezing landscape with no liquid water that is continually bombarded with harsh radiation. Scientists are interested in returning samples that may reveal what the Martian environment was like billions of years ago, when the planet was wetter and may have supported microbial life. There is no current evidence that the samples collected by the Mars 2020 mission from the first few inches of the Martian surface could contain microorganisms that would be harmful to Earth's environment. Nevertheless, out of an abundance of caution and in accordance with NASA policy and regulations, NASA would implement measures to ensure that the Mars samples are contained (with redundant layers of containment) so that they could not impact humans or Earth's environment, and the samples would remain contained until they are examined and confirmed safe for distribution to terrestrial science laboratories. NASA and its partners would use many of the basic principles that

biological laboratories use today to contain, handle, and study materials that are known or suspected to be dangerous.

Due to the large scope of the MSR Campaign and uncertainty regarding the timing, location, and environmental impacts of actions associated with the ground elements, the NEPA analysis will be conducted in two "tiers" (or phases). This approach is endorsed under both 40 CFR 1501.11 and 14 CFR 1216.307. Tier I, the focus of the PEIS, will programmatically address the potential impacts associated with the potential for multiple Lander launches (with the potential for RHUs to be incorporated into the Landers' design architecture) from either Kennedy Space Center or Cape Canaveral Space Force Station in Florida, launch of the Orbiter from French Guiana, and return of the Orbiter and EES to include initial recovery, containment, and handling of the samples once they reach the Earth's surface (i.e., at the UTTR landing site). Currently, definitive mission-related requirements associated with MSR Campaign ground elements for sample transportation and a SRF are still in the early planning stages of development, but each will be described to the maximum extent practicable in the PEIS. These aspects will be addressed programmatically in the Tier I PEIS, to the extent that information is available, and will be analyzed in more specific detail in subsequent Tier II NEPA analysis once this information is available. The Tier I analysis will also address the site-specific proposal to land the vehicle containing the samples (the EES) at the UTTR.

Joel Carney,

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